Reinforcement of Science Learning through Local Culture: A Delphi Study

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ABSTRACT*: This study aims to explore the ways to reinforce science learning through local culture by using Delphi technique. Twenty four participants in various fields of study were selected. The result of study provides a framework for reinforcement of science learning through local culture on the theme life and environment.*

Keywords : ***science learning, local culture, Delphi technique***

INTRODUCTION

The holistic view of science learning should be integrated in various fields of study, try to understand diverse culture, link science, technology, and society into community (Bernstein. 1983: 29; Apple. 1996: 22; Latour. 1999: 22). Hence, the new era of science education in Thailand has its compass. Then, the Thai National Education Act is shaping its development and forming its contours. Bausor and Poole (2003: 117) pointed that science learning requires consideration of how science is affected by the contexts in which it is practiced, including the spiritual as well as the moral, the social, the historical, and the cultural. Attention also needs to be paid to the scope and the limits of science. Cultural aspects can reinforce learning about science, that is, it contains scientific conceptions that students should learn.

Culture and science are produced by the relationship between man and nature, and the interaction between man and society. To indigenous people, nature and culture cannot be easily separated. Cultural expressions are deeply extended to nature and the environment (Posey. 1998: 43). The importance of learning should have balance between local knowledge and modern scientific knowledge. Students can learn and understand the important things to serve their real needs. They can preserve environment and live together with nature through their local culture respectively (Na Thalang. 1991: 81).

This study try to understand how to reinforce science learning through local culture by employing Delphi method. The Delphi method has been the most widely used forecasting technique when subjective information is used. It can be defined as a stepwise procedure that allows the researcher to obtain a consensus opinion by separately collecting the opinion of several experts on one specific topic avoiding face-to-face discussion (Quaile and Fowles, 1975; Ford, 1975; Kendall, 1977; Riggs, 1983; Woudenberg, 1991). The study utilizing the Delphi technique was undertaken to identify, categorize, and prioritise research needs that should be addressed in the reinforcement of science learning through local culture.

OBJECTIVE

To study how to reinforcement science learning through local culture by using Delphi Technique.

METHODOLOGY

The study employed the Delphi technique to obtain a consensus from experts in a various filed of study about issues that are most need of research the reinforcement of science learning through local culture. The Delphi method aims to improve group decision-making by seeking opinions without face-to-face interaction. Linstone and Turoff (1978: 275) described the utility of the Delphi as a research technique particularly in the following situations: (1) the problem does not lend itself to precise analytical techniques but it can benefit from subjective judgements on a collective basis, and (2) the individuals who need to interact cannot be brought together in a face-to-face exchange because of time or cost constraints. Conventional conference tends to be dominated by particularly strong personalities or to give rise to an undesirable bandwagon effect.

Participant recruitment : the intent of this study was to investigate the opinion of 24 experts who concern the reinforcement of science learning through local culture. The experts was selected by purposive sampling from a several of field studies: five science curriculum developers, five educational technologists and evaluators, five ecologists and environmentalists, four national science teachers and master science teachers, and five indigenous specialists. All the experts' responses are measured numerically to calculate an average response and to determine the degree of agreement between the group. The number that is used to represent the consensus opinion of the group is the median and the most commonly used dispersion measure is the interquartile range. The

results from each step in the process are returned to the experts so as to collect their revised individual opinions, ideas and proposals always respecting the anonymous feature of the procedure.

Instrumentation : experts independently react to a list of prompt about particular issues. The response are tabulated, organized, and synthesized into topics. These categories are reported back to the experts. This cycle continues until a set of priority themes emerges. The study was initiated on February 2005 and concluded on June 2005. The panellists were mailed a set of surveys. The first round was generated form the author's knowledge about the reinforcement of science learning through local culture for Mathayomsuksa 3 students based on the subject of science (subcategory 2: life and environments).

The two rounds of the survey consisted of a list of 4-point Likert-scale items. The participants were requested to rate the importance of each theme to the reinforcement of science learning through local culture on the theme life and environment. Each prompt the panellists were to indicate their level of agreement with the statement by choosing from four options: strongly agree, agree, disagree, and strongly disagree. Participants were also invited to comment and respond to the representative supporting statements. Descriptive statistics for the group ratings were calculated: median, and interquartile range.

The ratings of research statements and rankings of major research categories by the group in the first round were compiled. Some numbers of theme were reduced for consideration by the panel to only the most highly rated theme from the first round. Participants in this round again ranked the major research categories as they did in the first round. But this time the descriptive information about how the group responded was provided. Participant experts were asked to review each item, consider the group response and then re-rate the items, taking the information into account.

FINDINGS

Participants

The results of the two round Delphi study reflect the consensus of opinions from 24 expert participants (Table 1). The first round questionnaire asked Delphi panel members to respond to the question in five issues how to reinforce science learning through local culture for Mathayomsuksa 3 students based on the topic life and environment. In total, 97 statements panel members were asked to rate on a Likert-type scale as to degree of agreement (3 = Strongly agree, 2 = Agree, 1 = Disagree, 0 = Strongly disagree). In addition, this round allowed them to provide more suggestion and discussion in the end of each issue.

Table 1 Demographic information of expert participants completing the Delphi study

Demographic item	First round		Second round	
	n	%	n	%
Gender				
Male	10	55.56	8	57.14
Female	8	44.44	6	42.86
Age				
Less than 30 year	1	4.17	1	7.14
31-40 years	3	12.50	1	7.14
41-50 years	8	33.33	6	42.86
51-60 years	6	25.00	6	42.86
Education				
Master degree	7	38.89	6	42.86
Doctoral degree	11	61.11	8	57.14
Institutional				
Affiliation	15	83.33	12	85.72
University	2	11.11	1	7.14
School	1	5.56	1	7.14
Public organization				

The second round questionnaire featured the panel rating for the 90 statements. Median and interquartile range were presented for all panel members. This round, panel members were asked to re-rate the items and taking the information into account.

Relevant science topic

The relevant science topics for reinforcement of science learning through local culture based on the topic life and environment was selected. It can be concluded three topics: Biological diversity, Ecosystem, and Environmental conservation.

The Delphi panel experts expressed their opinion to the relevant science topic for reinforcement of science learning through culture. Seven topics were accepted in both first and second rounds. According to the Institute of Promotion Teaching for Science and Technology (IPST) recommended, science subject for Mathayomsuksa 3 should be allowed learners understand and comprehend in the environmental community. Learners should aware the environmental problem and they also learn how to conserve environmental sustentation.

Learning objectives

Learning objectives were categorized into three domains: cognitive, psychomotor, and affective domains. Cognitive development should be focused on analysing the relationship between living things and environments/ecosystems, conclude the relationship between local culture and conservation of natural resources and environments, and discuss how to promote ways of conservation in local community.

Psycho-motor development should be focused on (1) observe and classify living things, (2) collect biological and physical data in ecosystem, (3) process the data to find out factors influencing the biological diversity, and (4) conclude the ways to sustainably conserve and manage natural resources and environments.

Affective development should be focused on (1) beware of environments, (2) beware of local culture, (3) accept local culture, (4) know the importance of the values of science-culture in accord, and (5) promote the behavior of environmental conservation.

Learning management

The learning management based on reinforcement of science learning through local culture can be categorized into four criteria. First, learning process consisted of five steps for gaining knowledge and understands scientific concepts and local culture. It can be named LADDA instructional model, which begins with learning, analysing, deciding, doing, and application. Second, reinforcement of science learning emphasizes on teacher's role in the classroom such as pay attention to students' activities, encourage students to learn scientific knowledge surrounding them. Third and fourth, learner's and teacher's roles in science classroom for cooperative learning based on the understanding between science and local culture.

Reinforcement include the way to reinforce science learning through local culture. Teacher should accept an opinion and a reason of students; teacher pays attention to the students; teacher looks after the students to be safe while doing and experiment; teacher pays attention to give suggestions while the students study; teacher builds the scientific learning atmosphere; teacher understands feeling and nature of students; teacher concerns and gives useful suggestion to the students; teacher acts as a role model of a scientific mind; teacher promotes environmental conservation behavior; teacher promotes the students to accept local culture; teacher promotes students to accept science-culture in accord; and teacher invites indigenous specialist into classroom to transfer the knowledge to the students.

The roles of student include student explores nature by employing scientific method, analyzes environmental problems in local community, makes scientific learning atmosphere, discusses what they have learnt creatively, pays attention to experiments, has a good attitude towards science, promotes the values of science, promotes environmental conservation behaviour, and awares of and accepts local culture.

The roles of teacher include teacher prepares learning environment, prepares learning materials, motivates students to observe natural phenomena and environment, cares for safety experimentation, pays attention and observes student's experimentation, tries to understand student's feeling, takes reasonable response, listens to the students and gives valuable suggestion, admires and encourages to all students, establishes the values of science for all students, promotes environmental conservation behavior, awares of and accepts science-culture in accord, acts as a role model of scientific mind, monitors scientific learning behavior of the students, and monitors scientific learning achievement of the students.

Materials and learning resources

Teacher can reinforce science learning through local culture by employing the diversity of materials and learning resources. Materials and learning resources can be easily found in local community and related to the way of life. It can stimulate the expression of learners. Also, science and local culture will be harmonized if materials and learning resources help learners reach aims of science education.

Assessment

Finally, the assessment is considered for reinforcement of science learning through local culture. All panel members analysed and rated five items about assessment. The result revealed that the assessment should be related to learning management by employing authentic assessment that reflects the knowledge skills, scientific process skills, and values of culture for scientific method of the students. To assess the students was done by observation for learning behaviors of the students in every learning step and by a variety ways e.g. questioning, observing, and checking the projects. Students also assess themselves in order to express their feeling and analyze their works and to let the results from the assessment return to the students.

DISCUSSION

The study of diverse experts has produced results that raise framework how to reinforce science learning through local culture on the theme life and environment. Five issues were rated: Relevance science topic, learning objectives, learning management, materials and learning resources, and assessment. To students' life in their community, science learning should be development of the ability to solve problems, think globally act locally, and bring science to serve way of life (Hadzigeorgiou and Konsolas. 2001: 40). It should be also pointed out that science education should not only provide students with opportunities to answer questions i.e., "how do we know?", "why does it happen?", "what can we do with our knowledge?", "how can we communicate these ideas?", but also the question "why do we know?" will purpose more

important to discuss the purpose of learning (Osborne. 1996: 54). Students will always feel that what they are supposed to learn and live with community.

The result of Delphi method provided the several issues about curriculum design, instruction, implementation, and assessment. The opinions of experts in five issues meet the national science education standard subcategory 2, Life and Environment. The findings suggested how to make science learning atmosphere based on local culture and serve students' development both scientific knowledge and local culture traits. Students will be combined scientific knowledge from their own culture with experimental techniques they learned.

This study has shown the theoretical and practical ways to serve science learning for students. The reinforcement of science learning through local culture engaged science and science education to meet local culture, the way of life, and daily life activities, which interacted science culture. The detailed responses of the experts provided valuable suggestion to promote process of science, pedagogical practice, content knowledge, conservation behavior, and value of science-culture accord.

Also, the study concerned how to reinforcement of science learning through local culture. It provided ways to promote science learning and local culture studies. Teachers can bring these opinions into classroom by creating educational curriculum based on school and community contexts. Learners will build a body of knowledge about the natural and physical worlds. Indigenous people ways of thinking about the world reflect a worldview distinct from some scientific knowledge. Local culture, science is not separated from daily life. It is interspersed with way of communicating, practicing, and thinking (Kawagley et al. 1998: 137).

Thailand has diversely existed culture which science can play its role in the classroom. Science is rapidly disappearing and alerts us to concerns about the loss of biological diversity, environment destruction, climate change, and extinction. However, we know very little about how we are losing local culture and how we can teach our children about local culture. The Delphi technique helps science educator making ideas to insert local culture in science classroom. The way of knowing science through local culture is challenged.

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